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TITLE: A PRODUCT CAPABLE OF TRANSFORMING A TOXIC,  
CORROSIVE OR ENVIRONMENTALLY HARMFUL LIQUID  
PRODUCT INTO A HARMLESS OR NON-AGGRESSIVE  
RESIDUE

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A PRODUCT CAPABLE OF TRANSFORMING A TOXIC, CORROSIVE  
OR ENVIRONMENTALLY HARMFUL LIQUID PRODUCT INTO  
A HARMLESS OR NON-AGGRESSIVE RESIDUE

FIELD OF THE INVENTION

5       The object of the invention is a product capable of transforming a toxic, corrosive or environmentally harmful liquid product into a harmless or non-aggressive residue.

BACKGROUND OF THE INVENTION

10       Situations can occur in which toxic, corrosive or environmentally harmful liquid products such as strong acids, strong bases, powerful oxidants and reducers, solvents, oils, and fats, spill onto the benches or floor when being handled in the laboratory or in factories or during transportation. It is therefore very important to be  
15       able to clean them up and dispose of them quickly.

      Different types of clean up methods and products are used depending on the type of liquid spilled.

      For example, acid or alkaline products are usually cleaned up by rinsing with plenty of water. However, large  
20       quantities of water are required, and sometimes a clearance of the laboratory or factory. Alternatively, such liquid products can be pumped away. However, the choice of pump will depend on the nature of the product which has been spilled. Another solution is to pour sand or clay or an  
25       absorbent or super-absorbent product over the toxic or corrosive product and then sweep everything away. However,

the residues obtained remain aggressive and suitable equipment is therefore needed whilst the person dealing with the problem must exercise caution to avoid any contact with any part of the body since there is still a high risk  
5 of burning or irritation.

Furthermore, absorbent or super-absorbent products can not be used to clean up strong acids or bases. These latter destroy their absorbent properties and therefore render them useless.

10 Accordingly, the choice of cleaning method will depend on the type of liquid that has been spilled. To date, no product has been found which can be used as an effective universal treatment for all corrosive, hazardous and/or environmentally harmful liquid products.

15 OBJECTS AND DETAILED DESCRIPTION OF THE INVENTION

It is to the credit of the inventor that a product has now been defined and developed which is capable of transforming a toxic, corrosive or environmentally harmful liquid product into a non-aggressive and harmless residue,  
20 which is characterized by the fact that it comprises:

- at least one amphoteric selected in such a way that:

- the pH of said residue obtained is within the range of from 5 to 10, preferably 5.5 to 9.7,
- the lowest acidic pK of the amphoteric is within  
25 the range of from 5 to 10, preferably from 5.5 to 9.7, and the highest basic pK of the amphoteric

is within the range of from 5 to 10 and preferably from 5 to 8,

- the highest basic pK of the amphoteric is lower than the lowest of the acidic pK values,
- 5 - at least one lipophilic absorbent and
- at least one hydrophilic absorbent.

The term "liquid product" is used here to denote any product having a liquid, semi-liquid, semi-pasty or pasty consistency.

- 10 It should be pointed out that an amphoteric is a substance or an ion which can fulfil the function of an acid in one situation and can fulfil the role of a base in another situation. It therefore has at least two dissociation constants (pK), one corresponding to the
- 15 acidic function and the other to the basic function.

It should be pointed out that the pK is the opposite of the logarithm to the base 10 of the constant of the reaction :



- Furthermore, the term "acidic pK" is used to denote
- 20 the pK when the amphoteric is acidic, and "basic pK" is used to denote the pK when the amphoteric is basic.

In a preferred embodiment, the object of the invention is a product comprising at least two amphoterics selected in such a way and in such proportions that:

- 25 - the pH of the residue is within the range of from 5 to 10 and preferably from 5.5 to 9.7,

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- the lowest of the acidic pK values is within the range of from 5 to 10 and preferably from 5.5 to 9.7 and the highest of the basic pK values is within the range of from 5 to 10 and preferably from 5 to 8,
  - 5 - the highest basic pK is lower than the lowest of the acidic pK values and
  - the ratio of the sum of the number of moles of amphotericics having an acidic pK within the range of from 5 to 10, and preferably from 5.5 to 9.7, to the  
10 sum of the number of moles of amphotericics having a basic pK within the range of from 5 to 10, and preferably from 5 to 8, is between 0.1 and 10.

The product according to the invention comprises:

- from 20 to 60% by weight, preferably from 15 to 55% by  
15 weight and more preferably still from 10 to 45% by weight, of at least one amphoteric as defined above,
- from 2 to 20% by weight, preferably from 2 to 15% and more preferably still from 1 to 10%, of at least one lipophilic absorbent and
- 20 - from 2 to 20% by weight, preferably from 2 to 15% and even more preferably from 1 to 10%, of at least one hydrophilic absorbent.

In most cases, at least two different amphotericics are used, one of which has an acidic pK and the other having a  
25 basic pK conforming to the requirements outlined above and which, for the sake of convenience, will be referred to

hereafter as "anti-basic amphoteric" and "anti-acidic amphoteric", respectively.

The anti-basic amphoteric and the anti-acidic amphoteric are preferably not conjugate, i.e. one does not  
5 produce the other by an acid-base reaction.

The anti-basic amphoteric and anti-acidic amphoteric which may be used are in particular those described in patents FR86 11754 and FR86 14042 filed by the Assignee. In particular, the amphoteric used may be selected from the  
10 group comprising: the aminated acids such as glycine, alanine, serine, glutamine, lysine, alanyl alanine, histidine, L-histidyl-histidine, arginylarginine and mixtures thereof, sodium bicarbonate, trisodium edetate, disodium citrate.

15 The product according to the invention may contain a single amphoteric provided it has an acidic pK on the one hand and a basic pK on the other which comply with the conditions outline above.

Amongst the amphoteric of this type, mention may be  
20 made of L-histidyl-histidine and arginylarginine.

For the purposes of this invention, by lipophilic absorbents is meant absorbents or super-absorbents which are polymer products in particular, such as polyisobornene made by ATOCHEM and sold under the  
25 NORSOREX® brand and the products sold under the following names: OIL ABSORBER by SNF FLOERGER, GAMSORB by GAMLEN

INDUSTRIES SA, granulated RHON'SEC by TOLSA FRANCE SA.

By hydrophilic absorbents is meant the hydrophilic absorbents and super-absorbents, in particular the acrylic super-absorbents such as NORSOCRYL® S35 sold by ATOCHEM and  
5 the products sold under the names of AQUALIC® LAW45 by BASF, ASAP® 2000 and ASAP® 2003 by CHEMDAL LTD, FAVOR Z1030 by STOCKHAUSEN, DRYTECH 4535R by DOW CHEMICALS, AQUASORB 3005K1 by SNF FLOERGER, granulated RHON'SEC by TOLSA FRANCE SA.

10 The product according to the invention may contain additives, in particular coloring agents, anti-static agents, granulating agents, fillers and mixtures thereof.

The product according to the invention is in the form of a powder, granules or tablets. In one particular  
15 embodiment of the invention, the absorbent and neutralizing product is packaged in packs of shapes and dimensions suitable for obtaining for example sheets or sausages, making the product easier to use. Said packs are made in particular from a plastic or non-woven netting.

20 It may sometimes be necessary to add before use a certain quantity of water to the product according to the invention. This will be the case in particular if the spilled liquid is a strong acid. Since the latter contains only very little water, it may prove necessary to add some  
25 to ensure that the neutralization reaction is complete.

When the product according to the invention is applied

on the liquid to be treated, the product swells and solidifies. A solid residue is thus obtained, which may be more or less compact depending on the nature of the toxic, corrosive or harmful liquid spilled. It is easy to dispose  
 5 of this solid residue using a scraper, a brush or a shovel for example, without any risk of burning or irritation to the handler.

**Examples :**

10 In the following examples, the product according to the invention is a mixture based on the following formula, given for 1 kg:

- 440.1 g of sodium bicarbonate,
- 393.4 g of glycine,
- 15 - 83.3 g of NORSOCRYL S35,
- 83.3 g of NORSOREX APX1.

**Example 1 : Use of the product according to the invention on potassium hydroxide :**

20 100 ml of potassium hydroxide (KOH) having the concentration indicated in Table 1 below are tipped over a bench. The powder according to the invention is then spread initially around the puddle of KOH and then over its entire surface, in the quantities indicated in Table 1.

25 The powder swells and solidifies. The pH measurement taken with a pH paper shows that the residue obtained has a



pH within the neutral pH range of 5.5 to 9.7.

Table 1:

<u>Concentration of KOH</u> <u>in mol/l</u>	<u>Quantity of powder</u> <u>according to the invention</u> <u>in grams</u>
18	1000
12	670
6	340
1	60

5 Example 2 : Use of the product according to the invention  
on ammonia

Example 1 is repeated replacing the 100 ml of potassium hydroxide with 100 ml of ammonia  $\text{NH}_4\text{OH}$ , the concentrations of which are set out in Table 2.

10 The quantities of the powder according to the invention are also set out in Table 2.

Table 2:

<u>Concentration of <math>\text{NH}_4\text{OH}</math></u> <u>in mol/l</u>	<u>Quantity of the powder</u> <u>according to the invention</u> <u>in grams</u>
21	590
14	390
6	170
1	30

Example 3 : Use of the product according to the invention  
on sulphuric acid  $H_2SO_4$

5        100 ml of  $H_2SO_4$ , the concentration of which is set out  
in Table 3 below, are tipped over a bench. The powder  
according to the invention is then spread around the puddle  
of  $H_2SO_4$  and then over its entire surface, in the quantities  
indicated in Table 3. Bubbles appear and a solid residue  
10 forms. A few drops of water are then added, the residue  
swells and more bubbles appear indicating that  
neutralization is complete.

A measurement taken with a pH paper shows that the  
solid residue formed is indeed within the neutral pH range  
15 of from 5.5 to 9.7.

Table 3 :

<u>Concentration of <math>H_2SO_4</math></u> <u>in mol/l</u>	<u>Quantity of the powder</u> <u>according to the invention</u> <u>in grams</u>
18	1000
12	670
6	340
1	60

Example 4 : Use of the product according to the invention  
on nitric acid  $\text{HNO}_3$

5        Example 3 is repeated replacing the 100 ml of  $\text{H}_2\text{SO}_4$  with 100 ml of  $\text{HNO}_3$ .

         The quantities of powder to be applied for each concentration of  $\text{HNO}_3$  are indicated in Table 4 below:

10    Table 4:

<u>Concentration of <math>\text{HNO}_3</math></u> <u>in mol/l</u>	<u>Quantity of the powder</u> <u>according to the invention</u> <u>in grams</u>
21	590
14	390
6	170
1	30

         The same quantities of powder may be applied if another strong acid (such as hydrochloric acid, trichloroacetic acid) is spilled.

Example 5 : Use of the product according to the invention  
on acetic acid  $\text{CH}_3\text{COOH}$

Example 3 is repeated, replacing the 100 ml of  $\text{H}_2\text{SO}_4$   
 5 with 100 ml of  $\text{CH}_3\text{COOH}$ .

The quantities of powder to be applied for each  
 concentration of  $\text{CH}_3\text{COOH}$  are set out in Table 5 below.

Table 5:

10

<u>Concentration of <math>\text{CH}_3\text{COOH}</math></u> <u>in mol/l</u>	<u>Quantity of the powder</u> <u>according to the invention</u> <u>in grams</u>
18	220
6	80
1	12